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ABSTRACT

Users of instructional innovations in civilian and military instructional settings were compared in factors that influence the adoption of new technologies for their respective learning environments. Administrators and instructors from Florida public school systems and the U.S. Marine Corps participated in qualitative, quantitative, and attitudinal surveys to measure their adoption behavior. A survey instrument and followup interviews measured Florida teachers' attitudes toward instructional television (ITV). Survey instruments and onsite interviews collected data from Marines. Instruments measured the quantity and quality of Training and Audiovisual Support System (TAVSS) operations and Marines' attitudes toward TAVSS policies and practices. Rogers and Shoemaker's "perceived attributes of innovations and their rate of adoption" were correlated with the quality and quantity of use and attitudes toward instructional innovations. When compared, the two groups showed the same types of adoption concerns. The quantity, quality, and attitude results were influenced by the degree to which the potential adopter of a technological innovation perceived it to be relatively advantageous to existing instructional products and procedures, compatible with the curriculum or training program, available for short-term tryout, instructionally measurable by observation and data, and free from unnecessary complexity. (Author/YLB)

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MILITARY OR CIVILIAN USE OF INSTRUCTIONAL INNOVATIONS: IS THERE A DIFFERENCE?

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ABSTRACT

Users of instructional innovations in civilian and military instructional settings are compared in factors which influence the adoption of new technologies for their respective learning environments. Administrators and instructors from Florida Public School systems and the United States Marine Corps participated in qualitative, quantitative and attitudinal surveys to measure their adoption behavior. Rogers' and Shoemaker's "perceived attributes of innovations and their rate of adoption" were correlated with the quality and quantity of use and attitudes toward instructional innovations.

When compared, the two groups showed the same types of adoption concerns. The quantity, quality and attitude results were influenced by the degree to which the potential adopter of a technological innovation perceived the innovations to be relatively advantageous to existing instructional products and procedures; compatible with the curriculum or training program; available for short term "tryout"; instructionally measurable by observation and data; and free from unnecessary complexity.

INTRODUCTION

Instructional innovations are being designed and introduced into civilian and military instructional communities with the desire to improve learning. The curricula, training devices, instructional equipment and materials are often systematically designed using a popular method for determining the instructional need; analyzing the skills, knowledge and attitudes to be acquired; designing evaluation; conducting instruction and providing a means for revision of the materials.

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Frequently, an assumption is made that if the courseware and hardware is well-designed, the innovation will diffuse into the instructional system and be readily adopted by administrators and instructional personnel. A typical approach to predicting the successful utilization of a new technological innovation is to question administrative personnel at the instructional setting and obtain a personal prediction as to the likelihood for success.

Two studies on the adoption and utilization behavior of military and civilian instructional personnel offer generalizable results. They confirm that a systematic measure of user perception grounded in a theory for the prediction of dissemination and diffusion of innovations is valuable in both civilian and military settings.

The quality and quantity of use and attitudes toward instructional innovations in the Florida Public Schools and the United States Marine Corps training centers were measured. Analogous levels of personnel (i.e., school system administrators and colonels; school principals and majors or captains; and classroom teachers and sergeants) were surveyed with regard to their quality and quantity of use and attitudes toward their respective instructional/training innovations. Rogers' and Shoemaker's "perceived attributes of innovations and their rate of adoption" was used to predict adoption behavior.

It was shown that the institution or agency plays only a small part in the results and that, given similar situations, civilian and military personnel share the same concerns, motivations and desires in making their adoption decisions.

Attributes of Successful Innovations

"An innovation is an idea, practice, or object perceived as new by an individual. Adoption is a decision to make full scale use of a new idea as the best course of action available" (Rogers & Shoemaker, 1971, pp. 19, 27). Several researchers and writers have proposed stages through which an innovative product or idea must pass in order to eventually become "adopted", i.e., put into full-scale use (Havelock, 1973; Miles, 1964; Rogers and Shoemaker, 1971; Zaltman, Florio & Sikorski, 1977).

Rogers' and Shoemaker's stages are applicable to civilian and military populations. Their stages of adoption include:

1. Awareness
2. Interest
3. Evaluation
4. Trial
5. Adoption

In the AWARENESS stage, a person learns about the new product or idea. The individual knows it exists but lacks specific information about it. The INTEREST stage is evidenced by the seeking of additional information about the innovative product or idea. If interest continues to grow the individual will want to know the potential of the new product.

The third step, EVALUATION, involves the individual making mental application of the new idea or product to present and anticipated future needs. A decision is then made to determine whether or not to try it. During the TRIAL stage, the individual actually utilizes the product on a small scale to determine the benefit to a particular situation. When the individual uses the new idea or product continuously, on a full scale, this constitutes the ADOPTION phase.

Rogers and Shoemaker (1971) proposed five attributes of innovations which have been documented to relate to rate of adoption. The five attributes are: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability. For these studies, the attributes are entitled the "attributes of successful innovations."

RELATIVE ADVANTAGE is the degree to which an individual perceives that a new idea or product (innovation) is better than the one it supersedes. It may be measured in terms of anticipated personal benefits, rewards, loss or punishment resulting from adopting the innovation.

Generalization: The relative advantage of an innovation is positively related to its rate of adoption.

COMPATIBILITY is the degree to which the new idea or product is consistent with existing values, past experiences and the needs of the person considering adoption of the innovation. Previous ideas are often used in determining the compatibility of an innovation.

Generalization: The compatibility of an innovation is positively related to its rate of adoption.

COMPLEXITY is the degree to which an innovation is perceived as difficult to use or understand. The ease with which an individual can acquire capabilities in the use of the innovation may be classified on a complexity--simplicity continuum.

Generalization: The complexity of an innovation is negatively related to its rate of adoption.

TRIALABILITY is the degree to which an innovation may be experimented or "tried out" on a limited basis; without committing the individual to a permanent adoption. The "try before you buy" opportunity is comforting to cautious adopters.

Generalization: The trialability of an innovation is positively related to its rate of adoption.

OBSERVABILITY is the degree to which the results of an innovation can be measured, observed and shared with other individuals. The results and outcomes of some products or ideas may be difficult to convey.

Generalization: The observability of an innovation is positively related to its rate of adoption.

Relative advantage, compatibility, complexity, trialability and observability are measured in terms of perceptions of these attributes by individuals engaged in the adoption process. Rogers and Shoemaker emphasize that it is the adopting individual's perceptions of the attributes of the innovations, NOT the attributes as classified by those who are developing the innovation or promoting the adoption of it, which will affect the rate of adoption.

THE STUDIES

Method

Both studies involved the measurement of adoption of instructional innovations. A civilian-based study, "The Relationship Between Teacher Perceptions of Instructional Television Delivery System Attributes and Their Use of Instructional Television Programming" (Weinstein, 1981), surveyed 244 teachers at 53 schools in ten Florida School Districts. Interviews and classroom visits were conducted with 114 teachers at 41 schools. A "Comprehensive Instructional Television Survey Instrument" (CISI) and follow-up interviews measured teachers attitudes toward instructional television (ITV), their quantity and quality of use of ITV, and the degree to which they perceived that their ITV delivery system possesses the attributes of successful innovations.

The military study, "Management Training Systems Design Report for the Marine Corps Training and Audiovisual Support System" (Zumbado, Fulbright, Berry & Weinstein, 1983), surveyed 397 Marines at 16 Training and Audiovisual Support Centers, the Training and Audiovisual Support Department at the Marine Corps Development and Education Center, Headquarters Marine Corps and the Naval Training Equipment Center. Interviews were conducted with 257 Marines at the 18 survey locations. Comprehensive survey instruments and on-site interviews were developed to consistently collect data at the management and instructional personnel levels. The survey instruments were specifically designed to measure the quantity and quality of Training and Audiovisual Support System (TAVSS) operations and attitudes toward TAVSS policies and practices.

Survey Instruments

The procedure for the development of survey instruments was identical for both studies. Content of the items for the Florida Schools and Marine Corps, however, were geared toward the research requirements of the respective studies.

In both studies, knowledgeable administrative and instructional personnel were consulted during all phases of the instrument development. They were asked to describe their methods for selecting, acquiring, utilizing and evaluating instructional products and materials; practices for integrating these products and materials into the instructional sequences; and their personal experiences and attitudes toward the technological innovations in their instructional environment.

The range and variety of responses from 25 knowledgeable participants, in each of the studies, were verified by additional knowledgeable individuals to be representative of the range and types of methods, practices and attitudes experienced by instructional personnel in their respective settings. A "pool" of content-valid items was compiled for placement into survey scales.

Data collection items for both studies were selected from the "pool" of items. The items were based on issues and topics associated with six training delivery management areas under study by the Marine Corps and the several instructional television delivery systems being compared among the Florida Schools.

All items considered for the survey had received clarity and appropriateness endorsements from at least one-third of the reviewers. First, draft survey items were generated as declarative statements for which a fixed-choice response would be required.

Each item was coded according to the types of personnel that should respond and according to the attribute of successful innovations that it could best measure. There are many dimensions employed that would be appropriate for responding to each statement. The continuua utilized to assemble the Likert-scale instruments included:

Time	-percentage of time involved
Efficiency	-degree of efficiency
Effectiveness	-degree of effectiveness
Difficulty	-level of difficulty
Availability	-degree of availability
Importance	-degree of importance

Each of these dimensions were expressed as a five position scale, for example:

Very Efficient	Efficient	Neither Efficient nor Inefficient	Inefficient	Very Inefficient

All of the items that required the same response were identified. Although the survey items were generated as measures of the management issues and topics in the Marine Corps or television delivery systems in the Florida Schools, the items could more easily be answered if they were grouped into scales in which all items in each scale were answered by the same response continuum.

Survey items were assembled into visually-pleasing and easy-to-complete scales. Each scale was prefaced by a brief set of instructions. The items were presented on the left half of the page and the five responses, plus "Don't Know" and "Not Applicable" responses, were arranged on the right half of the page.

Interview Items

Interview items were designed to augment and amplify the information collected by the survey forms. Coupled with on-site observation by the research staff, the data from the survey was able to be verified with review of tangible records of methods and practices in the instructional environment.

As with the survey items, interview questions received endorsement from at least one-third of the reviewers. The interviews were general questions encompassing the concepts and facts collected by the survey instruments.

Data Collection

In the Florida Schools study, survey forms were distributed to the school systems' offices of media services for subsequent distribution to the 53 individual schools and 244 teachers. For the Marine Corps study, the survey forms were distributed to the 18 Training and Audiovisual Support Centers (TAVSC) and Marine Corps administrative offices which, in turn, disseminated them to the 397 instructional and administrative personnel.

Approximately two weeks after receipt of their respective survey forms, 114 Florida school teachers and 257 Marines were interviewed. The interviews lasted approximately 15 minutes each.

Two to three weeks prior to the interviews, each point of contact received the survey forms and instructions for their distribution and collection. The points of contact at the school media office level and the TAVSC often delegated distribution and collection to a subordinate person or persons.

All survey forms were coded with a letter designation and a number for each participant. The forms were color-coded to indicate the types of personnel being surveyed.

The forms were collected during visits to the interview locations. Unreturned forms were easily retrieved by utilizing the survey form codes to locate the specific participants at each location. At the conclusion of the survey collection visit and interview of randomly selected participants, the point of contact was notified of the personnel who had not returned a completed form. These survey forms were to be returned by mail.

RESULTS

Results of the studies will encompass the reliability of the survey instruments; correlations of the attributes of successful innovations with the quantity and quality of use of instructional innovations and attitudes toward innovations; and the percentage of variance explained by the correlation of the attribute measures with the use and attitude measures.

Survey Instruments

Reliability coefficients for the survey instruments in the two studies indicate that the alphas, ranging from .64 to .82, are moderately high. Table 1 presents the coefficients by scale and study

Survey Results

Although 90% of the correlations were statistically significant (see Table 2) it should be noted that the coefficients were, for the most part, low (-.0197 to .33), accounting for less than 11% of the variance (see Table 3). Only three moderately strong correlations were encountered: relative advantage, compatibility and observability with attitudes toward instructional innovations. Despite the overwhelming statistical significances encountered, these low correlational findings may have limited practical significance to the educational planner or change agent.

Table 1

Reliability of Survey Scales for "Attributes of Successful Innovations" for the Florida Public Schools and Marine Corps Studies

	Florida Schools		Marine Corps	
Attribute	Alpha	# of items	Alpha	# of items
Relative Advantage	.78	16	.79	11
Compatibility	.79	17	.82	12
Complexity	.79	16	.64	13
Trialability	.67	13	.68	10
Observability	.82	13	.75	11

Florida Schools: N = 244
Marine Corps: N = 397

Table 2

Correlation of "Attributes of Successful Innovations" with Quantity and Quality of Use of Instructional Innovations and Attitudes Toward Instructional Innovations by Study

Attribute	Quantity of Use	Quality of Use	Attitude
Relative Advantage			
Florida Schools	.2911***	.1797*	.7117***
Marine Corps	.2479***	.2568***	.7656***
Compatibility			
Florida Schools	.2659***	.2409***	.5763***
Marine Corps	.2399***	.2988***	.7841***
Complexity			
Florida Schools	-.0609	-.0197	.1517**
Marine Corps	-.1818**	-.0841	.3823***
Trialability			
Florida Schools	.3306***	.2570***	.4357***
Marine Corps	.2162***	.2017***	.2906***
Observability			
Florida Schools	.2775***	.2841***	.7228***
Marine Corps	.1958**	.1621*	.6814***

Florida Schools N = 244
Marine Corps N = 397

* p <.05
** p <.01
*** p <.001

Table 3

Coefficients of Determination (Percentage of Variance Explained) for Correlation of "Attributes of Successful Innovations" with Quantity and Quality of Use of Instructional Innovations and Attitudes Toward Instructional Innovation by Study

Attribute	Quantity of Use	Quality of Use	Attitude
Relative Advantage			
Florida Schools	8.5	3.2	50.7
Marine Corps	6.1	6.6	58.6
Compatibility			
Florida Schools	7.1	5.8	33.2
Marine Corps	5.7	8.9	61.5
Complexity			
Florida Schools	.4	.04	2.3
Marine Corps	.06	.07	14.6
Trialability			
Florida Schools	10.9	6.6	18.9
Marine Corps	4.7	4.1	8.4
Observability			
Florida Schools	7.7	8.1	52.2
Marine Corps	3.8	2.6	46.4

Florida Schools N = 244
Marine Corps N = 397

DISCUSSION

The significance of these relationships were important in verifying the predictability of Rogers' and Shoemakers' (1971) attributes on the rate and level of use and attitudes of instructional innovations. Even though the relationships were not evidenced by strong correlations, the predicted direction of those relationships (positive or negative) was confirmed.

The attributes of relative advantage, compatibility, trialability and observability are proposed by Rogers and Shoemaker to be positively related to the rate of adoption. Correlations of these attributes with the quality, quantity and attitude measures in these two studies were all positive and all significant at the .05 level of probability or greater. Likewise, complexity, which is believed to be negatively related to rate of adoption, was negatively correlated with quantity and quality measures.

The findings of statistically significant relationships between a majority of the attributes of successful innovations and the quantity and quality of use and attitudes toward innovations in these studies substantiates the findings of several other studies (Clinton, 1972; Hahn, 1977; Kissock & Falk, 1978). In those studies attitudes toward instructional products were compared with the levels of use or stages of adoption.

In the present studies, a positive relationship was found between the attributes of relative advantage, compatibility, trialability and observability and the quantity, quality and attitude measures. Complexity was found to be negatively related to the above measures.

Hahn (1977) in a study on the adoption of new social studies materials found similar relationships between four new constructs based on Rogers' and Shoemakers' attributes and teachers' attitudes toward those materials. The correlations of difficulty (viz. complexity) with attitudes were slightly negative, $r\ (532) = -.16$ to .22, $p < .01$, while in these studies they were $r\ (244) = .15$, $p < .01$ for the Florida Schools and $r\ (397) = .38$ $p < .001$ for the Marine Corps.

The correlational comparisons involving Hahn's constructs of "observable benefits," "investment requirements" and "familiarity" were lower than the comparable attributes measured by the Florida School and Marine Corps studies. In all of the investigations, the coefficients (other than complexity) were positive.

Kissock and Falk (1978), in a reconsideration of Hahn's study, measured Rogers' and Shoemakers' attributes of innovations as well as Hahn's constructs. With respect to the attributes of innovations, they found that relative advantage, compatibility, trialability and observability were positively correlated with attitudes and adoption. Their correlations with attitudes were lower than those in Hahn's, the Florida Schools or Marine Corps studies, but confirm the significance of the relationship.

Clinton (1972) measured perceived attitudes toward 18 different innovations related to the teaching-learning process and instructional organizations. The conclusion, also confirmed by the present studies, was that "the attributes accruing to innovations are perhaps as relevant to implementation of innovations as are external factors -- how a teacher perceives a new idea or thing is as important as the idea or thing itself."

CONCLUSION

Instructional developers and facilitators of instructional innovations can benefit from the application of the attributes of innovation to their instructional programs. The degree to which innovative materials and/or equipment are perceived to be relatively advantageous and compatible, may be tried out on a limited basis, have observable results, and are not believed to be complex was positively related to the attitudes of instructional personnel in both the military and civilian instructional settings. There is not, however, a strong relationship in either environment between the degree to which the user perceives that the innovation possess the "attributes of successful innovations" and the use of the innovation.

Attitudes are an important determinant in the decision to incorporate or accept an innovation as an instructional tool. Perhaps positive attitudes toward quality utilization and quantity incorporation of innovations into a new or existing program should be fostered and encouraged.

Results of these studies underscore the conclusions of Rogers and Shoemaker that "it is the receivers' perceptions of the innovations, not necessarily the attributes as classified by experts or change agents, which affect their rate of adoption. Like beauty, innovations exist only in the eye of the beholder and it is the beholder's perceptions which influence the beholder's behavior" (p. 138).

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